

--ABSTRACT OF THE DISCLOSURE

Amorphous, nanoporous silica gel having an open channel structure may be surface modified at higher loading of surface modifying ligands, e.g., 7.5 mmole per gram, than known nanoporous silica gels. In one embodiment, an amorphous silica gel has a bimodal pore size distribution of pores at about 10 nanometers and at about 10 microns, and a bulk density of about 0.2 to about 0.25 g/ml. Surface modification with functionalized ligand groups, effective for selective adsorption or reaction catalysis, is achieved by gelling silica sol solution to form a wet silica gel, maintaining the gel at a relatively low elevated temperature in a moist state to obtain a wet nanoporous silica gel having a plurality of open channels within the gel structure and silanol groups on the surface and reacting the surface silanol groups with the ligand group to introduce the functionalized group. The surface modifying reaction may be carried out concurrently with the gelling of a silica precursor in an aqueous alcoholic medium. 3-mercaptopropyltrialkoxysilane is an exemplary ligand introducing compound. The chemically surface modified silica gel may be used, for example, to remove or concentrate metallic substances in a liquid, or to separate two or more metallic impurities from a mixture thereof, or for cleanup of oil or chemical contaminants from the surface of a body of water.--